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of Agriculture



Natural Resources
Conservation Service

Lakewood, Colorado

RWA 10260001

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Smoky Hill Headwaters Watershed

Hydrologic Unit Code 10260001

Rapid Assessment



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Introduction

Background Information

The Natural Resources Conservation Service (NRCS) is encouraging the development of rapid watershed assessments in order to increase the speed and efficiency generating information to guide conservation implementation, as well as the speed and efficiency of putting it into the hands of local decision makers.

Rapid watershed assessments provide initial estimates of where conservation investments would best address the concerns of landowners, conservation districts, and other community organizations and stakeholders. These assessments help landowners and local leaders set priorities and determine the best actions to achieve their goals.

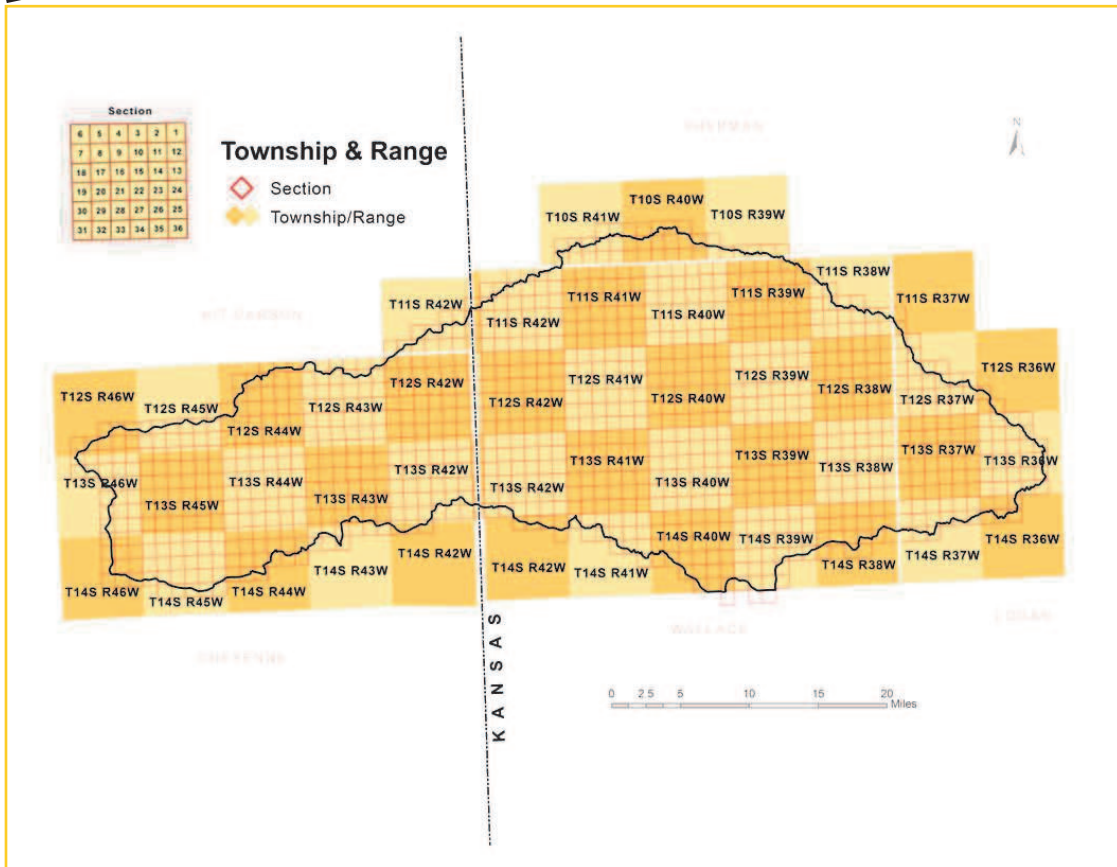
Benefits of these Activities

While rapid assessments provide less detail and analysis than full-blown studies and plans, they do provide the benefits of NRCS locally-led planning in less time and at a reduced cost. The benefits include:

- Quick and inexpensive tools for setting priorities and taking action
- Providing a level of detail that is sufficient for identifying actions that can be taken with no further watershed-level studies or analyses
- Actions to be taken may require further Federal or State permits or ESA or NEPA analysis but these activities are part of standard requirements for use of best management practices (BMPs) and conservation systems
- Identifying where further detailed analyses or watershed studies are needed
- Plans address multiple objectives and concerns of landowners and communities
- Plans are based on established partnerships at the local and state levels
- Plans enable landowners and communities to decide on the best mix of NRCS programs that will meet their goals
- Plans include the full array of conservation program tools (i.e. cost-share practices, easements, technical assistance)

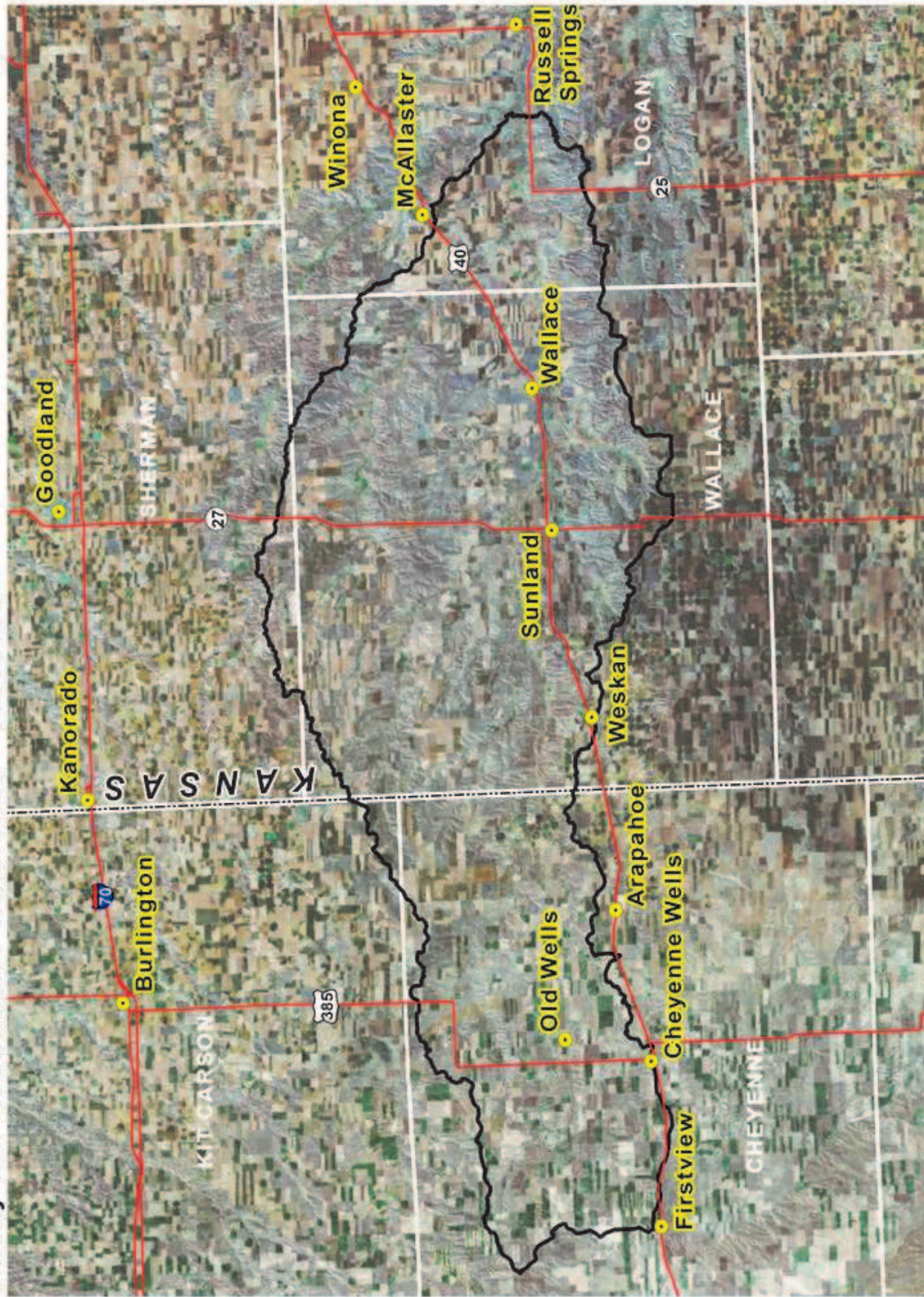
Rapid Watershed Assessments provide information that helps landowners and local leaders set conservation priorities.

The Smoky Hill Headwaters Watershed is located in the Republican River Basin, on the northeastern plains of Colorado. The watershed is 674,053 acres in size, with 211,851 acres in Colorado. Approximately 240 farms and ranches cover 404,639 acres in the entire watershed. As of April 2005, there are 37,261 acres of land in the Conservation Reserve Program.

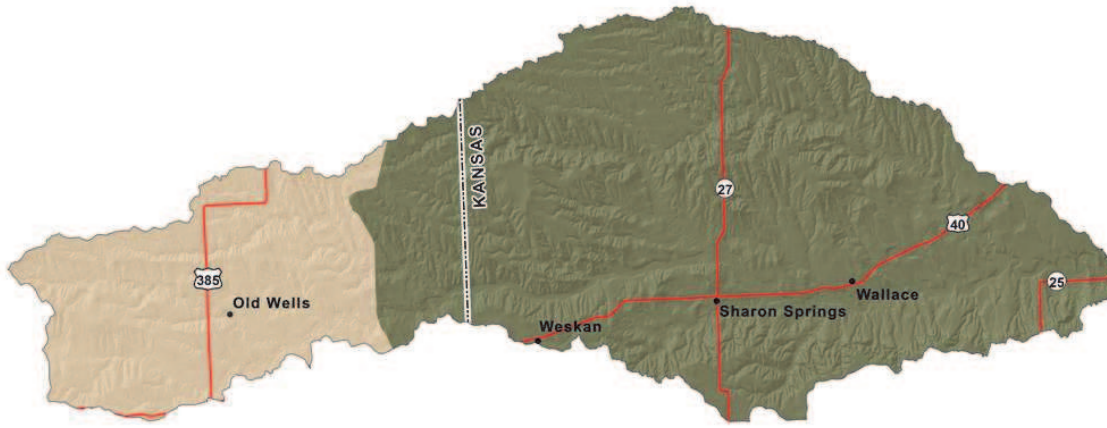


COLORADO County	County Acres	County Acres in SMOKY HILL HEADWATER Watershed	% of County in the Watershed	% of Watershed in the County
Cheyenne	1,140,382	206,790	18.1%	30.7%
Kit Carson	1,383,914	5,276	0.4%	0.8%
KANSAS				
Logan	688,123	61,630	9.0%	9.1%
Sherman	676,627	14,467	2.1%	2.1%
Wallace	585,647	385,929	65.9%	57.3%
		674,053		

Smoky Hill Headwaters Watershed - 10260002



Satellite Imagery Arc IMS Server - Geography Network Services hosted by ESRI



Common Resource Area (CRA)

67B.1 72.1

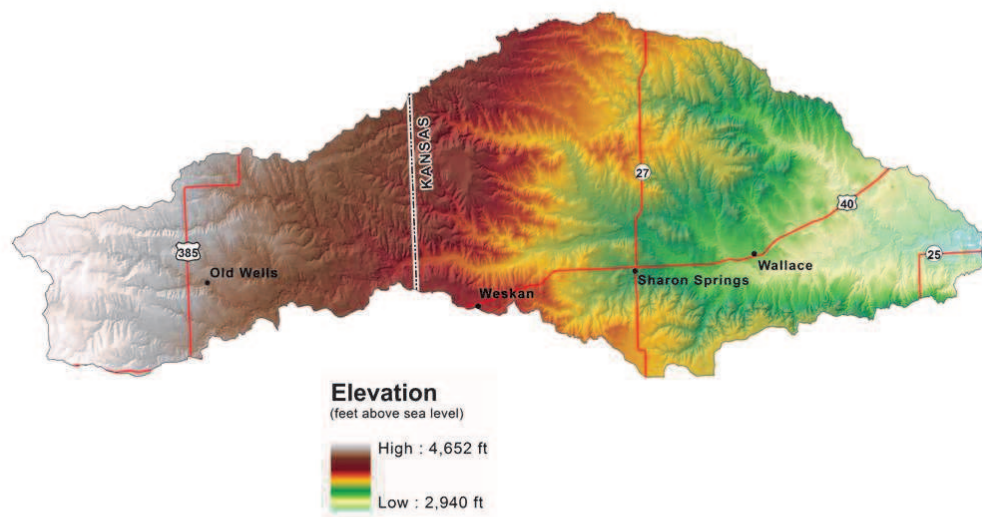
Common Resource Areas (CRA): Geographical areas where resource concerns, problems, and treatment needs are similar. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographical boundaries of the common resource area.

<u>MLRA</u>	<u>CRA</u>	<u>CRA NAME</u>	<u>CRA DESCRIPTION</u>
67B	67B.1	Central Great Plains, Southern Part	The Central High Plains, Southern Part CRA is broad, undulating to rolling plains dissected by streams and rivers. Local relief is measured in tens of feet on the plains. Soils are deep and formed in aeolian and alluvial materials. Pre-settlement vegetation was short grass prairies. Nearly all of this area in fallow cropland rotations or rangeland. Some cropland areas are irrigated.
72	72.1	Central High Tableland	The Central High Tableland CRA is broad, level to gently rolling, loess mantled tableland. Local relief is measured in feet on the tableland tens of feet and major river valleys bordered by steep slopes. Soils are deep. Pre-settlement vegetation was short grass prairies. Nearly all of this area in cropland, both dry land small grain crops and irrigated corn and grain sorghum.

Physical Description

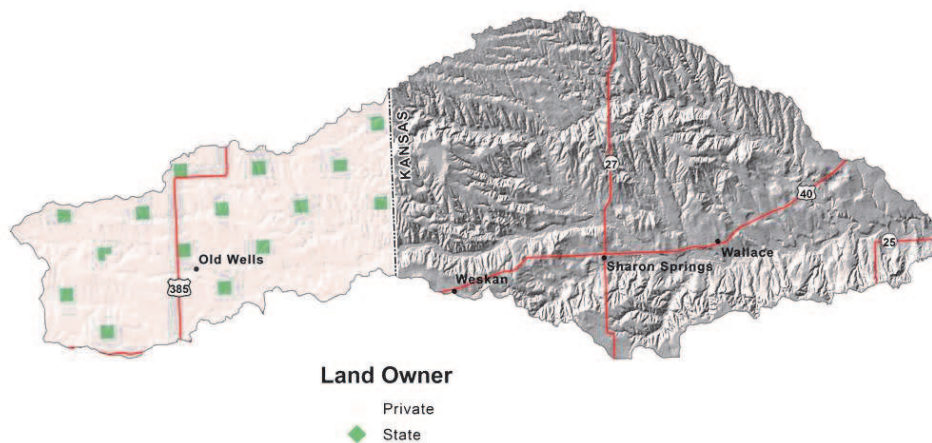
The Smoky Hill Headwaters watershed consists of broad, inter-valley remnants of smooth plain, with gently rolling slopes, punctuated by steeper slopes along the drainages.

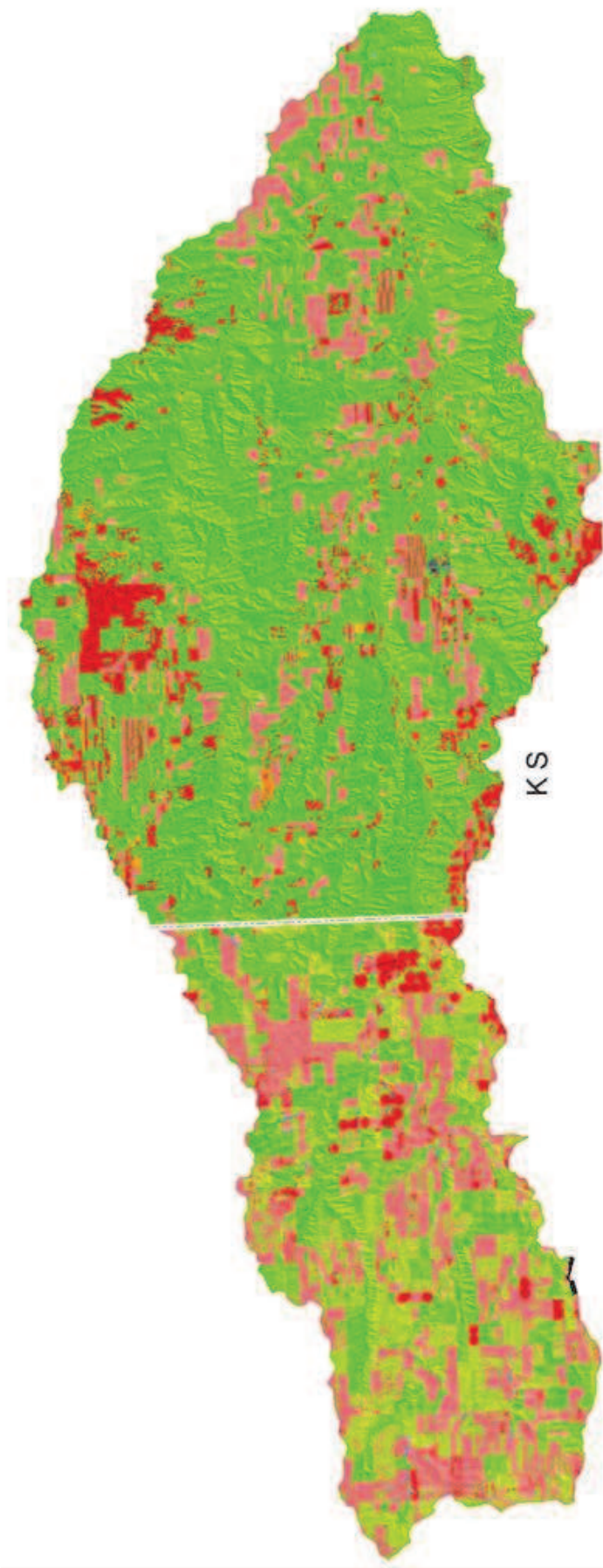
The predominant land use is agriculture, consisting of cash grain farming and livestock production. Cropland is dominated by dryland winter wheat rotations, and corn and grain sorghum production in areas where irrigation is available. Steeper slopes are generally in native grasses and used for livestock grazing.



Land Ownership

Approximately 202,675 acres in the Smoky Hill Headwaters Watershed are privately owned, and 9,355 acres are state controlled land.





Vegetation

co_cvp83

Vegetation (Colorado)

- | | | | |
|---|---------------------|---|---------------------|
| ■ | Dryland Ag | ■ | Irrigated Ag |
| ■ | Grass Dominated | ■ | Riparian |
| ■ | Grass/Forb Mix | ■ | Sagebrush/Grass Mix |
| ■ | Herbaceous Riparian | ■ | Short-grass Prairie |
| ■ | Urban/Built Up | ■ | Soil |

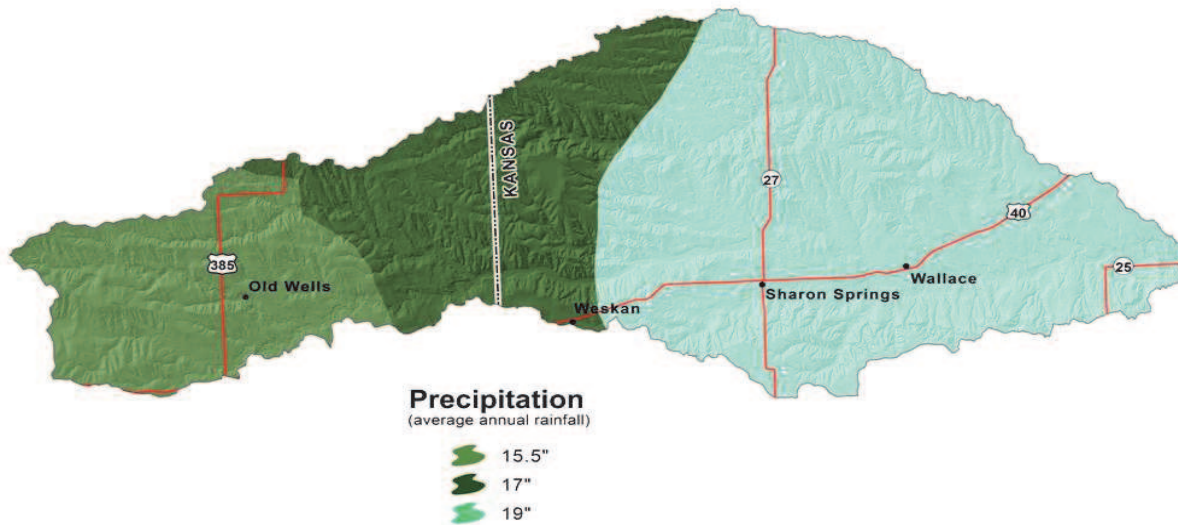
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Vegetation (Kansas)

- | | | | |
|---|--------------------------------------|---|------------------------------|
| ■ | Water | ■ | Mixed Forest |
| ■ | Low Intensity Residential | ■ | Shrubland |
| ■ | High Intensity Residential | ■ | Grassland/Herbaceous |
| ■ | Commercial/Industrial/Transportation | ■ | Pasture/Hay |
| ■ | Bare Rock/Sand/Clay | ■ | Row Crops |
| ■ | Deciduous Forest | ■ | Small Grains |
| ■ | Evergreen Forest | ■ | Fallow |
| | | ■ | Emergent Herbaceous Wetlands |

SMOKY HILL HEADWATER S Colorado Land Use	Total Acreage	Vegetation	Acreage
Cropland	95,272	Irrigated Ag	10,650.4
		Dryland Ag	84,622.0
Rangeland/Grassland	114,965	Grass Dominated	50,643.1
		Grass/Forb Mix	14,128.0
		Sagebrush/Grass Mix	11.2
		Short-grass Prairie	50,182.4
Riparian	1,394	Herbaceous Riparian	1,174.4
		Riparian	219.9
Other	220	Soil	9.9
		Urban/Built Up	210.0
Total Colorado Watershed Acres			211,851

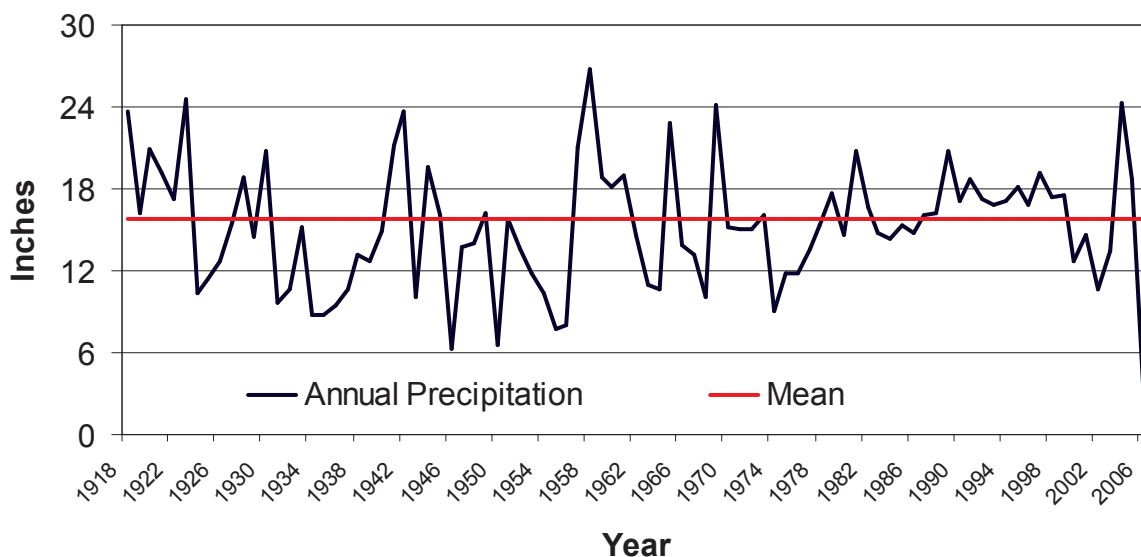
SMOKY HILL HEADWATER S Kansas Land Use	Total Acreage	Vegetation	Acreage
Cropland	111,717	Pasture /Hay	4,737.0
		Row Crops	39,004.6
		Small Grains	66,183.7
		Fallow	1,792.0
Rangeland/Grassland	348,865	Shrubland	4,742.5
		Grasslands/Herbaceous	344,122.2
Forest	711	Deciduous Forest	111.5
		Evergreen Forest	599.4
		Mixed Forest	0.4
Riparian	205	Emergent Herbaceous Wetlands	204.7
Water	49	Water	49.0
Other	466	Low Intensity Residential	327.1
		High Intensity Residential	37.2
		Commercial/Industrial/Transportation	101.7
		Barer Rock/Sand/Clay	0.4
Total Kansas Watershed Acres			462,013



Precipitation in the Smoky Hill watershed averages between 15 and 17 inches per year. Droughts are common in the watershed, as with the rest of Colorado. Statewide, in the 1900's alone, four prolonged dry spells occurred. The first took place in the 1910s, and another, in the '30s, caused the dust-bowl period. The second worst drought on record in the state occurred in the mid-50s, when a series of hot, dry summers following a period of scant mountain snow-pack created water shortages. The fourth serious drought hit parts of Colorado in the late 1970s, and the most severe drought of the century occurred in 2002. Climatic records have been kept in Colorado since the late 1800s, and researchers look to tree ring data for clues to climatic conditions prior to the record. Tree ring data indicates historic occasions of acute drought in Colorado, with some lasting many years.

Rainfall in the watershed typically occurs as frontal storms in the early summer, and as high intensity, convective thunderstorms in late summer. Maximum precipitation is from mid spring through late autumn, and precipitation in winter is snow. The average annual temperature is from 37 to 66 degrees F. The frost free period averages 156 days but ranges from 106 to 184 days.

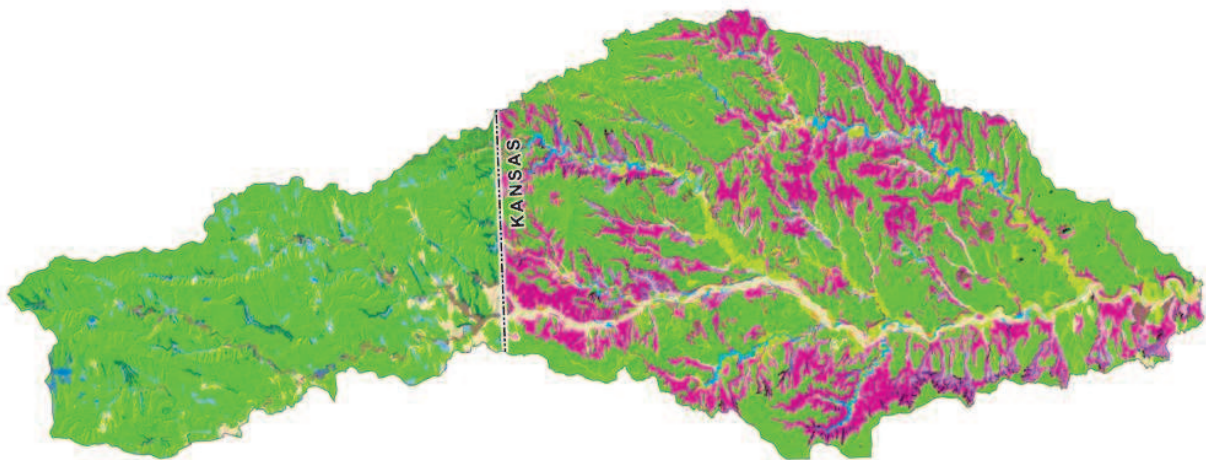
Smoky Hill Headwaters Precipitation, 1918-2006



Ecological Sites

The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production.

Ecological Site maps give an overall indication of the soils plant relationship in the area. More detailed descriptions of ecological sites are provided in the Field Office Technical Guide (FOTG). The FOTG is available in local offices of the Natural Resources Conservation Service (NRCS) and online at <http://www.nrcs.usda.gov/technical/efotg/>.



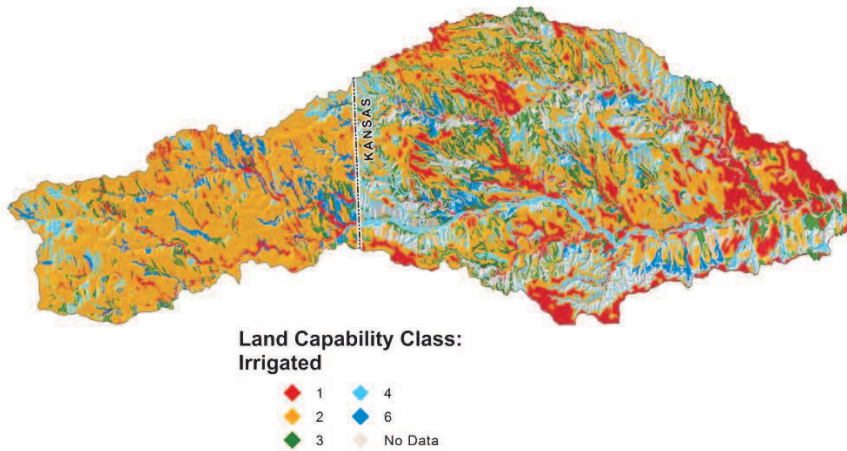
Soil: Ecological Site Name

◆ No Data	◆ Loamy Slopes
◆ Chalk Flats	◆ Loess Breaks
◆ Clay Terrace	◆ Overflow
◆ Clay Upland	◆ Plains Swale
◆ Closed Upland Depression	◆ Saline Subirrigated
◆ Clayey	◆ Sandy Lowland
◆ Gravelly Hills	◆ Sandy Terrace
◆ Gravel Breaks	◆ Shale Breaks
◆ Loamy Lowland	◆ Shallow Limy
◆ Loamy Terrace	◆ Subirrigated
◆ Loamy Upland	◆ Saline Overflow
◆ Limestone Breaks	◆ Salt Flat
◆ Limy Upland	◆ Sands
◆ Loamy	◆ Sandy Bottomland
◆ Loamy Plains	

Land Capability Classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in

grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations that show suitability and limitations of groups of soils for rangeland, for wood land, and for engineering purposes.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use.



Class 1 - soils have few limitations that restrict their use.

Class 2 - soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 - soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

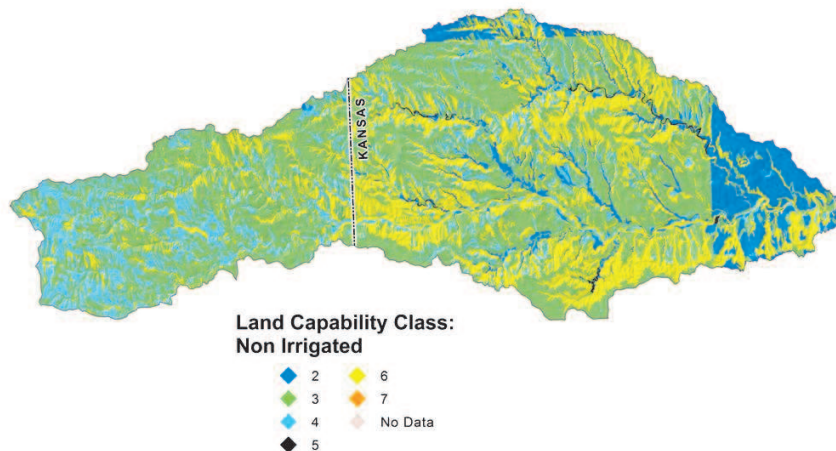
Class 4 - soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 - soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 - soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

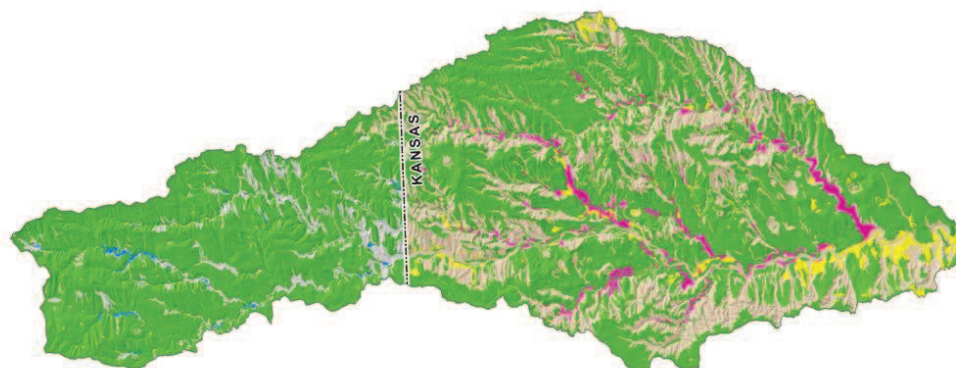
Class 7 - soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 - soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or aesthetic purposes.



Prime farmland is land that has the best combination of physical characteristics for producing food, feed, forage, fiber and oil seed crops and is also available for these.

Colorado had approximately 1,696,800 acres of nonfederal prime farmland recorded in 1997. This represents over 2 percent of the states total land area or 4 percent of the nonfederal land in Colorado. Nationally, 64 percent of soils classified as prime farmland are being used for cropland. In Colorado, 93 percent of the soils classified as prime farmland are being utilized as cropland.

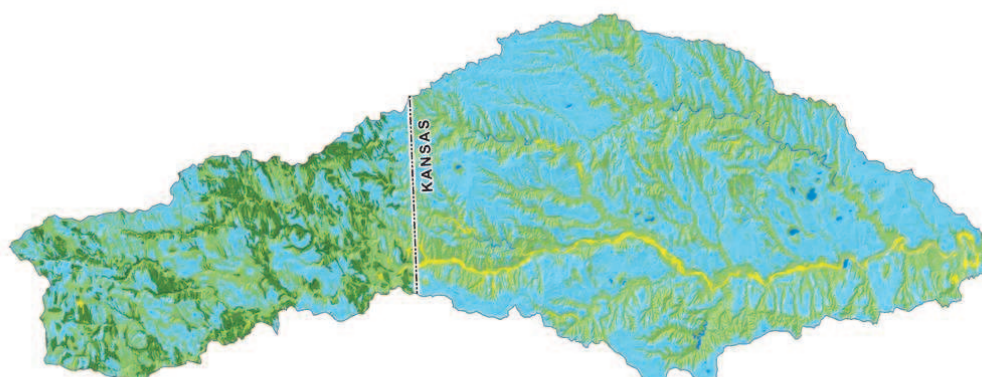


Farmland Classification

- No Data
- ◆ All areas are prime farmland
- ◆ Farmland of statewide importance
- Not prime farmland
- ◆ Prime farmland if irrigated
- ◆ Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Wind Erodibility Index

The Wind Erodibility Index (WEI), is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion if it is assumed there is no vegetative cover or management.



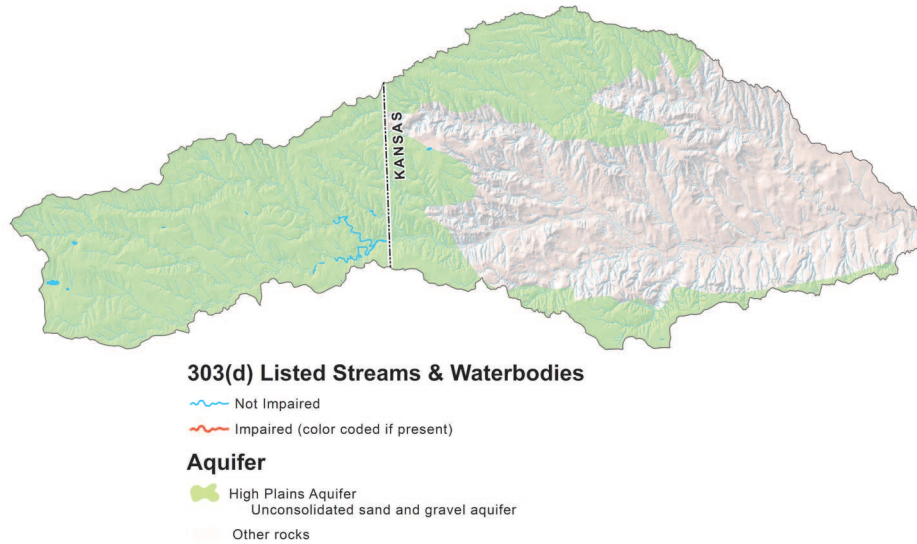
Wind Erodibility Index (Tons/Acre/Year)

- ◆ No Loss
- ◆ 134
- ◆ 38
- ◆ 48
- ◆ 56
- ◆ 86
- ◆ No Data

Soils with an erodibility index equal to or greater than 8 are considered highly erodible. As shown on the Wind Erodibility Index map below, most soils in the Smoky Hill Headwaters Watershed are considered highly erodible.

Surface Water Quality

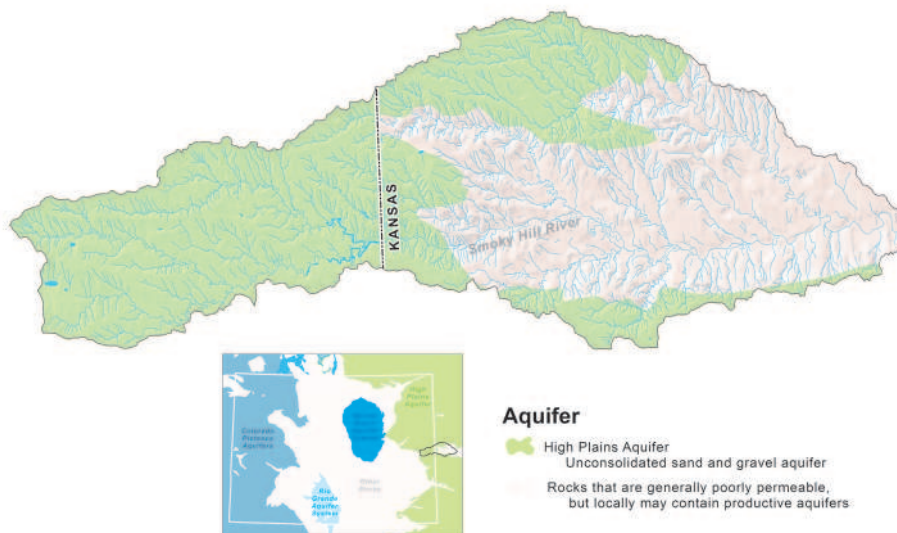
Surface water quality in the Smoky Hill Headwaters Watershed is generally good. Section 303(d) of the Clean Water Act requires states to identify and list all water bodies where state water quality standards are not being met for designated uses. As indicated in the map, there are no 303(d) listed streams in the watershed. The Smoky Hill Headwaters are designated as Primary Contact Recreation, Aquatic Life Warm I, and Agriculture.



Section 303(d) of the Clean Water Act requires states to identify and list all water bodies where state water quality standards are not being met. Thereafter, TMDLs compromising quantitative objectives and strategies have been or will be developed for these impaired waters within the watershed in order to achieve their water quality standards. Updates to the 303d/TMDL list can be found at: [http://www.cdphe.state.co.us/op/wqcc/SpecialTopics/303\(d\)/303dtmdlpro.html](http://www.cdphe.state.co.us/op/wqcc/SpecialTopics/303(d)/303dtmdlpro.html)

Ground Water

The High Plains Aquifer underlies the Smoky Hill Headwaters watershed, and is the primary source of irrigation and domestic water for the area. The High Plains aquifer is an extensive regional aquifer that underlies the Great Plains states extending from South Dakota on the north to Texas and New Mexico on the south.



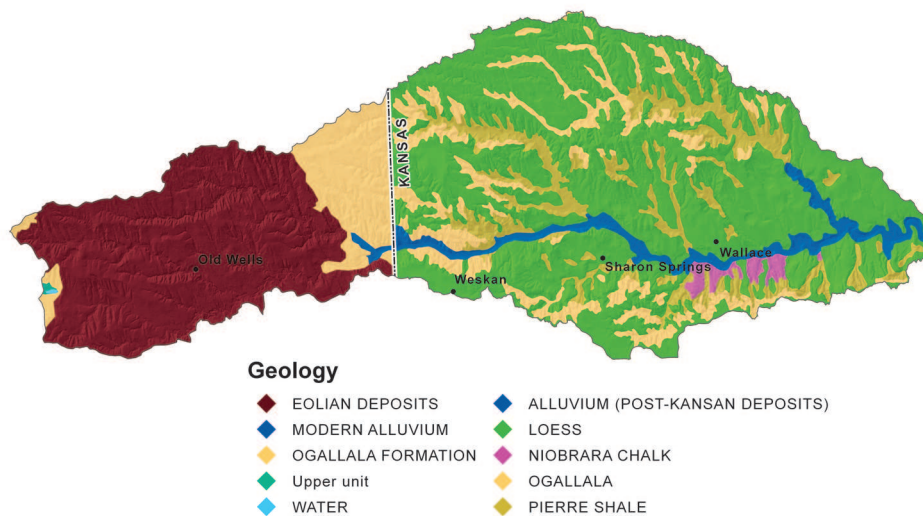
Ground water quality is generally good. Total dissolved solids in the aquifer have risen significantly since the early 1900s, and in some areas, the water may exceed drinking water standards for sulfate, chloride, fluoride, iron and arsenic. These concentrations may be naturally

Era	System	Series	Stratigraphic Unit	Unit Thickness (feet)	Physical Characteristics	Hydro-geologic Unit	Hydrologic Characteristics
Cenozoic	Quaternary	Holocene and Pleistocene	Valley-fill deposits	0 to 60	Stream deposits of gravel, sand, silt, clay associated with the most recent cycle of erosion and deposition along present streams	High Plains aquifer	Shallow water-table aquifer(s). Well yields range from 500 to more than 1,000 gpm in several river valleys
			Dune sand	0 to 300	Fine to medium sand with small amounts of clay, silt, and coarse sand formed into hills and ridges by the wind		Typically lies above the water table; has a high infiltration rate and is important for ground-water recharge
			Loess	0 to 250	Silt with lesser amounts of very fine sand and clay deposited as windblown dust		Lies above the water table and does not yield water; serves for minor recharge
		Pleistocene	Unconsolidated alluvial deposits	0 to 550	Stream deposits of gravel, sand, silt, and clay locally cemented by calcium carbonate into caliche or mortar beds		Primary portion of the High Plains aquifer; mostly unconfined; yields range from 100 to 3,100 gpm; typically less than 300 gpm in Colorado; Ogallala is the most significant High Plains aquifer resource
	Tertiary	Miocene	Ogallala Formation	0 to 700	Poorly sorted clay, silt, sand, and gravel generally unconsolidated; forms caliche layers or mortar beds when cemented by calcium carbonate; Ogallala makes up large part of High Plains aquifer		Can be confined; moderately permeable. May yield up to 200 gpm in localized areas
			Arikaree Group	0 to 1,000	Predominantly massive, very-fine to fine-grained sandstone with localized beds of volcanic ash, silty sand, siltstone, claystone, sandy clay, limestone, marl, and mortar beds; part of the High Plains aquifer		Typically confined, except at outcrop; yields typically less than 100 gpm
		Oligocene	White River Group	0 to 700	Upper unit, Brule Formation, is considered part of the High Plains aquifer in Colorado, predominantly massive sandstone containing sandstone beds and channel deposits Lower unit, Chadron Formation, mainly consists of varicolored, bentonitic, loosely to moderately cemented clay and silt		Chadron is mostly impermeable

From Gutentag and others, 1984

Geology

The Smoky Hill Headwater Watershed overlies the Ogallala formation. Alluvial Pleistocene deposits and Eolian sands cover much of the uplands surrounding the .

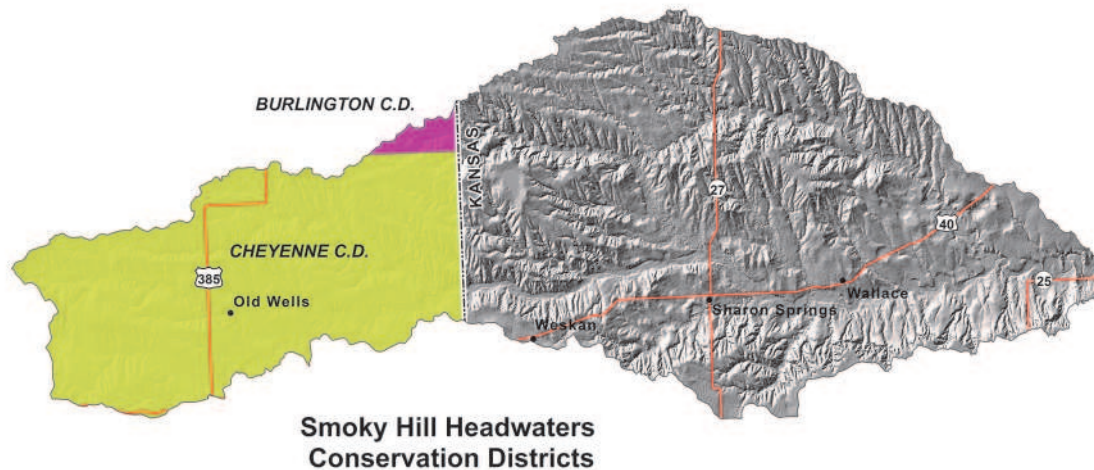


Threatened & Endangered Species

State & Federally Threatened, Endangered & Candidate Species as well as Species of Special Concern in Smoky Hill Headwaters

	Common Name	Scientific Name	Class	Federal Status	State Status	Comments
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Birds	None	Threatened	May migrate through watershed
	Black-footed Ferret	<i>Mustela nigripes</i>	Mammals	Endangered	Endangered	No current records of occurrence
	Black-tailed Prairie Dog	<i>Cynomys ludovicianus</i>	Mammals	None	Concern	Occurs in the watershed
	Brassy Minnow	<i>Hybognathus hankinsoni</i>	Fish	None	Threatened	May occur in the watershed
	Burrowing Owl	<i>Athene cunicularia</i>	Birds	None	Threatened	Occurs in the watershed
	Cylindrical paper-shell	<i>Anodontoidea ferussacianus</i>	Gastropods	None	Concern	May occur in the watershed
	Ferruginous Hawk	<i>Buteo regalis</i>	Birds	None	Concern	Occurs in the watershed
	Long-Billed Curlew	<i>Numenius americanus</i>	Birds	None	Concern	May occur in the watershed
	Massasauga	<i>Sistrurus catenatus</i>	Reptiles	None	Concern	May occur in the watershed
	Mountain Plover	<i>Charadrius montanus</i>	Birds	None	Concern	Occurs in the watershed
	Northern leopard frog	<i>Rana pipiens</i>	Amphibians	None	Concern	May occur in the watershed
	Plains Leopard Frog	<i>Rana blairi</i>	Amphibians	None	Concern	May occur in the watershed
	Plains Orangethroat Darter	<i>Etheostoma spectabile</i>	Fish	None	Concern	May occur in the watershed
	Swift fox	<i>Vulpes velox</i>	Mammals	None	Concern	Occurs in the watershed
	Yellow mud turtle	<i>Kinosternon flavescens</i>	Reptiles	None	Concern	May occur in the watershed

Social Data	Cheyenne	Kit Carson
Demographics (US Census, American Factfinder)		
Total population	2,231	8,011
Male	1,119	4,236
Female	1,112	3,775
Median age (years)	37.9	37.4
White	2,072	6,992
Black or African American	11	139
American Indian and Alaska Native	17	41
Asian	3	26
Native Hawaiian and Other Pacific Islander	0	3
Some other race	114	737
Hispanic or Latino (of any race)	181	1095
Economic Characteristics (US Census, American Factfinder)		
In labor force (population 16 years and over)	1,066	3,746
Median household income (dollars)	37,054	33,152
Median family income (dollars)	44,394	41,867
Per capita income (dollars)	17,850	16,964
Families below poverty level	53	198
Individuals below poverty level	244	908
County Agricultural Characteristics (Colorado Agricultural Census, county data tables)		
Farms (number)	283	678
Land in farms/ranches (acres)	740,486	1,247,181
Average size farm/ranch (acres)	2,617	1,840
Median size farm (acres)	1,528	11,112
Average age of farmer or rancher	57.2	54.3
Net cash return from ag sales (\$1,000)	1,829	3,392
Cattle and calves (number)	20,000	148,000



Smoky Hill Headwaters Watershed Natural Resource Concerns

Resource Concern By Priority	Cheyenne	Burlington	Total
Rangeland/Grazingland Health and Productivity	12	3	15
Water Quality/Quantity	8	6	14
Sustainable Cropland	10		10
Trees for Conservation Planting	6	4	10
Erosion		5	5
Invasive Weeds	4		4
Outreach and Education	2	2	4

Smoky Hill Headwaters Conservation District Priorities:

The Colorado Conservation Districts identified and prioritized these resource concerns during facilitated public meetings and they are included in their Long Range Plans. Higher scores indicate higher priority.

Selected Conservation Application Data				
	FY 2005	FY 2006	FY 2007	Total
Total Conservation Systems Planned (Acres)	7,662	13,165	4,164	24,991
Total Conservation Systems Applied (Acres)	14,011	17,144	5,716	36,871
Practices				
Conservation Crop Rotation (328)	264	483	1,691	2,438
Prescribed Grazing (528)	2,475	3,628	3,368	9,471
Upland Wildlife Habitat (645)	789	n/a	4,989	5,778
Irrigation Water Management (449)	215	1,107	1,421	2,743

Conservation Systems to Address Major Resource Concerns

Primary Resource Concern:	Rangeland Health			
Conservation System Description:	Prescribed Grazing—planned management that provides adequate recovery opportunity between grazing events and proper stocking of animals. Estimate 115,000 acres need to be treated on medium sized ranches of 3,500 acres.			Based on Conservation System Guide Code: CO 67B.1-GR-01-R-Grazing
Practices	Unit	Quantity	Cost/Unit (\$)	Estimated Cost (\$)
Prescribed Grazing:				
Fence (382)	Ft.	22,000	0.6	13,200
Pest Management (595)	Ac.	500	5.0	2,500
Pipeline (516)	Ft.	10,000	2.40	24,000
Upland Wildlife Habitat Management (645)	Ac.	500	na	0
Watering Facility (614)	No.	4	410	1,640
Windbreak/Shelterbelt Establishment (380)	Ft.	3,000	.85	2,550
Costs to apply prescribed grazing per median sized ranch of 3,500 acres	No.	33	43,890	
Subtotal: Rangeland costs				1,448,370

Conservation Systems to Address Major Resource Concerns (cont'd)

Primary Resource Concern: Soil Erosion By Wind on dryland crops				
Conservation System Description: Seasonal residue management with Conservation crop rotation, Nutrient and Pest Mgt			Reference Conservation System Guide Code: CO 67B.1-CR-Dryland-R-2	
Practices	Unit	Quantity	Cost/Unit (\$)	Estimated Cost (\$)
Conservation Crop Rotation (328)	Ac	60,000	5	300,000
Residue Mgmt, Seasonal (344)	Ac	50,000	5	250,000
Nutrient Management (590)	Ac	20,000	5	100,000
Pest Management (595)	Ac	20,000	15	300,000
Subtotal Costs Dryland Crops:				\$950,000

General Effects, Impacts, and Estimated Costs of Application of Conservation Systems

Landuse	Resource Concern	Measurable Effects	Non-measurable Effects	Estimated Cost (\$)
Rangeland	Plants		Improved plant condition, productivity, health and vigor. Grazing animals have adequate feed, forage, and shelter. Wildlife habitat is sustained or improved.	\$1,448,370
Dryland Crop	Soil	240,000 Total Tons/Year saved	Cropland sustainability	\$950,000
Estimated Total Costs to Address Major Resource Concerns:				\$2,398370

FOOTNOTES/ BIBLIOGRAPHY

303(d) listed streams within the Watershed were created using data from Colorado Department of Public Health & Environments' Water Quality & Control Commission. Impaired streams are current as of April 30, 2006. For a list of all Colorado impaired streams, locations and priority ratings, visit <http://www.cdphe.state.co.us/regulations/wqccregs/100293wqlimitedsegtmdls.pdf>.

Threatened and Endangered Species information was gathered using data from the Colorado Division of Wildlife (CDOW) Natural Diversity Information Source (NDIS). NDIS GIS data may be downloaded at <http://ndis.nrel.colostate.edu>.

Resource Concerns were identified using the Colorado Association of Conservation Districts' (CACD) long range (10 year) plans from the period of 1996-2000. Only the top three environmental resource concerns for each district were used. For more information on Colorado's Conservation Districts, visit <http://www.cacd.us>.

Maps were generated using Soil Survey Geographic Database (SSURGO) tabular and spatial data. SSURGO data was downloaded for the following Colorado and Kansas surveys:

Cheyenne County Area	(CO017)	12/19/2005	Sherman County Area	(KS181)	12/22/2006
Kit Carson County Area	(CO063)	12/20/2006	Wallace County Area	(KS199)	12/28/2006
Logan County Area	(KS109)	12/20/2006			

Vegetation data was generated using the Colorado Division of Wildlife's "Colorado Vegetation Classification Project" (CVCP) data. For more information on the Colorado Vegetation Classification Project, visit <http://ndis.nrel.colostate.edu/coveg>.

Common Resource Area (CRA), a subdivision of the Major Land Resource Area (MLRA), <http://soils.usda.gov/survey/geography/cra.html>.

Average Annual Precipitation data was developed through a partnership between the Natural Resources Conservation Service's (NRCS) National Water and Climate Center (NWCC), the National Cartography and Geospatial Center (NCGC), and the PRISM (the Parameter-elevation Regressions on Independent Slopes Model) group at Oregon State University (OSU), developers of PRISM.

Land Ownership (status, 12/31/2006 dataset) data was obtained from the Colorado Department of Transportation (CDOT). For more information, visit <http://www.dot.state.co.us>.

Relief & Elevation maps were created using the National Elevation Dataset (NED), 30m Digital Elevation Model (DEM) raster product assembled by the U.S. Geological Survey (USGS). For more information about the NED visit <http://ned.usgs.gov>. The data was downloaded from the NRCS Geospatial Data Gateway at <http://datagateway.nrcs.usda.gov>.

Conservation Systems to address major resource concerns were extracted from the Conservation Systems Guides (CSG) compiled from local conservationists by the NRCS Ecological Sciences Section at the Lakewood State Office.

Effects and Impacts of application of conservation systems were extracted from Colorado eFOTG, Section III, Resource Quality Criteria, NRCS, Colorado, March 2005 and CSG.

Cost Estimates to apply conservation systems were developed by estimating costs per median size farm and ranch and calculating costs from the field office cost lists.